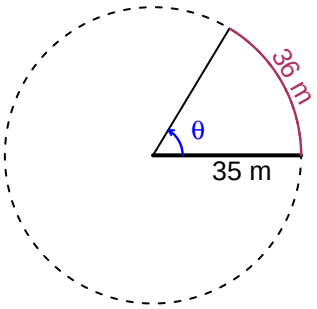
Name: Date:

Trig Final (SLTN v697)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 36 meters. The radius is 35 meters. What is the angle measure in radians?

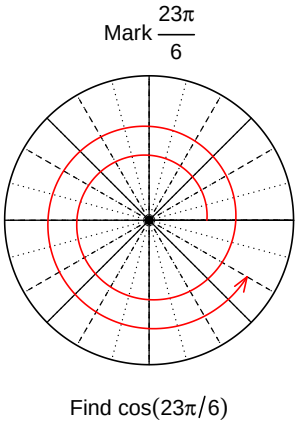


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

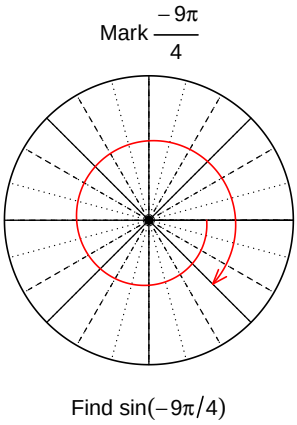
$\theta = 1.029$ radians.

Question 2

Consider angles $\frac{23\pi}{6}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{23\pi}{6}\right)$ and $\sin\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(23\pi/6)$



Find $\sin(-9\pi/4)$

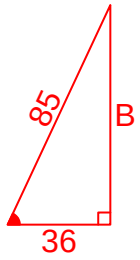
$\cos(23\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{36}{85}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

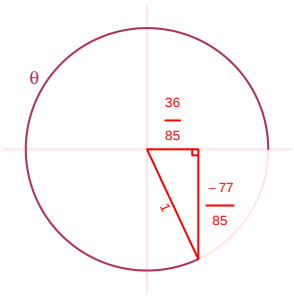
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-77}{85}}{\frac{36}{85}} = \frac{-77}{36}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.14 Hz, an amplitude of 2.67 meters, and a midline at $y = -3.99$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.67\sin(2\pi 7.14t) - 3.99$$

or

$$y = -2.67\sin(14.28\pi t) - 3.99$$

or

$$y = -2.67\sin(44.86t) - 3.99$$